

## Human Behaviour in Fire (E900306)

Course size (nominal values; actual values may depend on programme)

Credits	8.0	Study time	240 h	Contact hrs	48.0 h
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Course offerings and teaching methods in academic year 2019-2020

A (semester 2)	English	group work	17.5 h
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Lecturers in academic year 2019-2020

Ronchi, Enrico	LUND01 lecturer-in-charge
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Offered in the following programmes in 2019-2020

	crdts	offering
<a href="#">International Master of Science in Fire Safety Engineering</a>	8	A

Teaching languages

English

Keywords

Position of the course

The aim is that students should be able to understand and apply theories of human behaviour in fire, both fire setting and evacuation behaviour, after completion of the course. Student should furthermore recognize the importance of cultural and demographic factors for evacuation. The aim of the course is also that students are able to understand different egress modelling approaches and their limitations. In addition, students should understand and be able to apply relevant guidelines and regulations.

Contents

The course provides students with insight into theories of human behaviour in fires, both fire setting and evacuation behaviour, and computer modelling of evacuation. During the first part of the semester focus is placed on lectures and laboratory exercises. The material from the lectures will be included in the exam, which is held midway through the semester. During the second part of the semester the students focus on their group assignment, which is presented to fellow students and teachers at the final seminar.

Initial competences

Prerequisites: TO BE SPECIFIED LATER Admission Specifics: The number of participants is limited to 40.

Final competences

*Knowledge and Understanding*

For a passing grade the student must:

- be able to explain the various factors (psychological and environmental) that influence fire setting behaviour
- be able to explain RSET-models (simple stimuli-response models) that are commonly used in guidelines and regulations
- be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies)
- be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility)
- be able to explain social influence and give examples of situations when social influence will be particularly important
- be able to explain the basic assumptions behind egress models (network, grid and continuous models)

*Skills and Abilities*

For a passing grade the student must:

- apply RSET-models (simple stimuli-response models) to estimate the required safe escape time
- analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire
- analyse exit design based on the theory of affordances
- apply egress models to simulate movement of people during evacuation
- analyse results from simulations with egress models and relate the results to the assumptions of the model
- select appropriate occupant behaviour scenarios for fire safety engineering design
- communicate theories of human behaviour in fire to laymen and experts
- communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation)
- independently seek information (articles, reports, manuals, etc) about human behaviour in fire

#### *Judgement and approach*

For a passing grade the student must:

- adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments)
- adequately consider relevant ethical aspects relating to analysis of evacuation with egress models

#### Conditions for credit contract

This course unit cannot be taken via a credit contract

#### Conditions for exam contract

This course unit cannot be taken via an exam contract

#### Teaching methods

Group work, lecture, seminar, self-reliant study activities

#### Extra information on the teaching methods

##### **Lectures**

The lectures focus mainly on theories of human behaviour in fire, but also cover egress models. In the first couple of lectures fire setting behaviour is looked at. Both psychological and environmental factors are examined and special focus is placed on fire setting by children. The following lectures focus on the evacuation process and associated theories/models, rules and regulations as well as the effects of combustion products, heat and radiation on humans. These lectures cover such areas as RSET-models, the role-rule model, affiliation in emergencies, theory of affordances for exit design, help in emergencies and social influence. Ethics in relation to experiments with human participants (evacuation experiments) and ethical aspects of the use of egress models is also briefly covered. The final set of lectures, which are closely linked to laboratory exercises, focus on egress models and hand calculations.

##### **Lab exercises**

Laboratory exercises are performed both in the laboratory and with computers. There are a total of four lab exercises in the course, namely one field experiment and three computer labs. The exercises are:

- i) LAB1 - Evacuation experiment (field experiment)
- ii) LAB2 - Test of a grid-based egress model - STEPS (computer lab)
- iii) LAB3 - Test of continuous egress models - Simulex (computer lab)
- iv) LAB4 - Advanced egress modelling (computer lab)

In the first laboratory exercise (LAB1) you will perform an evacuation of a real building. Before the lab, you will decide what aspects you want to measure and how to do the measurements. This work will be performed by the entire class at a planning seminar. Finally, data from LAB1 are then analysed and published in LUVIT.

The second laboratory exercise (LAB2) focuses on modelling of egress with a grid-based model, e.g., STEPS. In the third laboratory exercise (LAB3) a continuous egress model, namely Simulex, will be used. In the fourth and final lab (LAB4) you will test more advanced egress modelling approaches in selected models (mainly STEPS). Written reports are required for all laboratory exercises in the course.

##### **Assignments**

There is one individual assignment and one group assignment in the course. Both assignments must be completed to get a passing grade. The two assignments are:

- 1) Assignment 1 - Exit Design and the Theory of Affordances (individual report)
- 2) Assignment 2 - Analysis of a Fire Incident (group report)

In the first assignment (Assignment 1) you will take a picture of an emergency exit and analyse the design using the Theory of Affordances. A presentation about the Theory of Affordances will be given in the course and you will also practice application of the theory. Assignment 1 shall be summarised in an individual report (max 5 pages including pictures).

In the second assignment (Assignment 2) you and your group members (ca 4-5 persons per group) will analyse a fire incident using the theories from the course. For examples, theories about exit choice behaviour can be used to explain people's choice

of exit, etc. You and your group members shall choose a fire incident for your analysis. Assignment 2 shall be summarised in a group report (max 20 pages excluding pictures) where you describe the accidents and apply the theories. In the report you also need to include a discussion and draw relevant conclusions. You and your group members will also present your assignment at a seminar (20 min presentation per group).

### **Seminars**

Two literature seminars are included in the course. At the seminars we will meet in smaller groups (ca 8 persons per group) and discuss a specific topic. Before the seminar you will have read a selection of publications. The two topics that will be discussed are ethics and 'panic'. A passing grade requires that you actively take part in both seminars, i.e., take part in the discussions. You must also have read the literature carefully before each seminar. More information about the seminars can be found in LUVIT.

### Learning materials and price

Everything downloadable from LUVIT.

### References

- Canter, D, Breaux, J, & Sime, J: Fire and Human Behaviour , Domestic, Multiple Occupancy, and Hospital Fires. John Wiley & Sons, Ltd., 1980.
- Hartson, H R: Behaviour & Information Technology, Cognitive, physical, sensory, and functional affordances in interaction design. 2003.
- Helbing, D, & Molnár, P: Physical Review E, Social force model for pedestrian dynamics. 1995.
- Sime, J: Environment and Behaviour, Movement Towards the Familiar - Person and Place Affiliation in a Fire Entrapment Setting. 1985.
- In addition scientific papers within the area "Human behaviour in fire" are included.

### Course content-related study coaching

#### Evaluation methods

end-of-term evaluation and continuous assessment

#### Examination methods in case of periodic evaluation during the first examination period

Written examination

#### Examination methods in case of periodic evaluation during the second examination period

Written examination

#### Examination methods in case of permanent evaluation

Oral examination, skills test

#### Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

#### Extra information on the examination methods

Assessment: The final certificate is based on a written examination (individual work), report/presentation (group work), report/presentation (individual work) and laboratory reports (group and individual work).

#### Calculation of the examination mark

Grades are only based on exam results. You are required to do assignments and labs to pass the course, but performance on these things do not influence the grade.